CHAPTER 7.4
FILTRATION

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7.4-1. GENERAL. Filtration removes suspended solids and precipitated metals from water by forcing the water through a porous medium using a pressure differential. Filtration can be used as a pretreatment or post-treatment process. There are various filtration systems available to meet project specific requirements. These include: gravity filtration, pressure filtration, continuous backwash filtration, bag filtration, and cartridge filtration.

7.4-2. PRODUCTS. The most commonly used filter types are granular media filters, precoat filters, cartridge filters, and bag filters. Verify filters conform to the plans and specifications for size, dimensions, and materials of construction.

7.4-3. EXECUTION.

a. Air Blowers. If air scour is used to clean the filter, ensure that the air blower meets applicable decibel requirements for noise control.

b. Filter Media. Placement of the filter media in a filtration system is critical to the successful operation of the unit. Normally, it is the supplier's responsibility to ensure that the filter media is placed appropriately. Verify correct placement of the media during installation.

7.4-4. OPERATION AND MAINTENANCE. Commonly encountered problems in the filtration of ground water include turbidity (suspended solids) breakthrough, mud ball formation, buildup of grease, oil and carbonates, development of cracks and contraction in the filter bed, loss of filtering media, air binding, gravel mounding, and media upset.

a. Turbidity Breakthrough. Unacceptable levels of turbidity may occur in the effluent before terminal head loss is reached. This problem is corrected by pretreating with filter aid chemicals upstream of the sedimentation tank or the filter.

b. Mud Ball Formation. Masses of solids, dirt, and media sometimes clump together and create mud balls which sink into the filter bed, reducing the effectiveness of filtering and backwash. Auxiliary washing processes (e.g.,air scour, surface wash) with, or followed by, water wash should be used to correct this situation.

c. Buildup of Oil and Grease. Emulsified oil or grease can accumulate within the filter bed. Air and surface wash usually help eliminate this problem. It may be necessary to install a washing system using sodium hypochlorite or special solutions.

d. Carbonate Buildup. Carbonate buildup can occur on media after lime neutralization. For small systems, improving process control over the neutralization step or an acid rinse should be used to correct this situation.

e. Back Washing. Back washing is performed to remove materials which have accumulated in filters. Operational problems of

filtration units are usually associated with blinding and bridging within the media. This is indicated by more frequent backwash demands and reduced unit effectiveness. This problem must normally be rectified through modification of upstream processes. Other operational concerns deal with the frequency of back washing. Control systems may be set on a timer, calling for backwash after a preset time frame. The timer setting should be adjusted to optimize the length of filter runs without excessive head loss. The length of filter backwash and rinse may be manually adjustable to allow complete cleaning of the filter without wasting backwash water. This method of control is contrasted by another type which relies upon differential pressure through the filter bed. In either event, backwash is normally an automated process which requires little operator attention. Air scouring of filters is sometimes performed if backwashing is no longer effective at restoring clogged filters. Occasionally, the filter material must be replaced or replenished.

f. Cracks/Contraction. Cracks can develop when the filter is not cleaned properly. The backwash and air scour operations should be adjusted if this occurs.

g. Loss of Media. Loss of media can occur during back washing or through the underdrain system. This can be caused by backwash rates that exceed the recommended flow.

h. Air Binding. Air binding occurs when the head loss at any point in the filter exceeds the static head (water depth) above that point. When this occurs, dissolved gases in the water are released and form bubbles in the bed, further aggravating the head loss problem. Sometimes excessive air or water backwash rates that exceed the suppliers recommendations can entrap air in the beds as well. To correct this situation, the contractor should backwash the filter to allow 20 percent maximum bed expansion or at a rate recommended by the media supplier, and then allow water to stand in the bed for a period adequate to allow entrapped gases to escape.

i. Gravel Mounding. Gravel mounding occurs when support gravel is disrupted during the backwash cycle. The contractor should correct this situation by overlaying the support gravel with a layer of high density material such as ilmenite or garnet, or modify the backwash process.

j. Media Upset. Filter media can be upset (mixed) if the backflow wash water rate is reduced to quickly.